

FILE COPY

72.71

RETURN TO
DIVISION OF WATER

Newark Division of Water

ANNUAL REPORT
OF THE
DIVISION OF WATER
FOR
1934

FILE COPY

RETURN TO
DIVISION OF WATER

ANNUAL REPORT
OF THE
DIVISION OF WATER

Mr. James W. Costello, Chief Engineer
Department of Public Affairs
Newark, New Jersey

Dear Sir:

The annual report of the various Bureaus of the Division of Water
for the year 1934 is herewith submitted.

Respectfully,

WGB:FM

WILLIAM G. BANK
DIVISION ENGINEER.

ANNUAL REPORT
OF THE
BUREAU OF WATER SUPPLY
(DIVISION OF WATER)

BUREAU OF WATER SUPPLY

COVERING

COLLECTION, PURIFICATION, TRANSMISSION AND CEDAR GROVE RESERVOIR

ALFRED E. ANDERSON

ASSISTANT ENGINEER - IN CHARGE

COLLECTION

PRECIPITATION ON PEQUANNOCK WATERSHED

The precipitation on the Pequannock Watershed as determined from the average of observations at 3 locations, Canistear Reservoir, Oak Ridge Reservoir and Charlotteburg, amounted to 52.86 inches for the year 1934. This is above normal. During the month of September there was a rainfall of 12 inches, one of the greatest monthly amounts on record.

STORAGE AND DEPLETION - PEQUANNOCK RESERVOIR

The Pequannock Reservoirs were practically full and overflowing from January 20, 1934 until February 10th, from March 25th until June 5th and from December 1st until the 31st. A maximum draw-down of 16 feet occurred in Oak Ridge Reservoir in the early part of September. However, at this time water was drawn from this reservoir only, in an attempt to lower the reservoir level for inspection of emergency control gates.

WATER DIVERSION

A total of 13,350.1 million gallons of water were diverted from the Pequannock Watershed during 1934 as contrasted with 12,747.6 million gallons in 1933 an increase of 602.5 million gallons.

From Wanaque Reservoir 6,629.9 million gallons of water were taken by Newark in 1934 as compared with 5110.4 million gallons in 1933, an increase of 1,519.5 million gallons.

Month by month figures of the amount of the 1934 diversions are shown in the last two columns of Table 1 of this report.

The Pequannock diversion figures differ from the figures of consumption of Pequannock

water by the amount of the gain or loss in storage in Cedar Grove Reservoir. The total consumption of Pequannock water as seen in the next paragraph is less than Pequannock diversion by ^{24.0}~~24.0~~ million gallons, which agrees substantially with the net gain in Cedar Grove Reservoir storage during the year 1934.

WATER CONSUMPTION

The total consumption of water in the Newark system for the year 1934 was ^{19956.0}~~18,455.4~~ million gallons, an average of 54.7 million gallons daily, an increase of 2,069.2 million gallons or 5.7 million gallons daily, from the 1933 figure of 17,886.2 million gallons total for the year and 49.0 million gallons daily. Of this, ^{13326.1}~~13,325.5~~ million gallons (36.5 million gallons daily) were from the Pequannock supply and 6,629.9 million gallons (18.2 million gallons daily) from the Wanaque supply as compared with 12,775.8 million gallons (35.0 million gallons daily) from the Pequannock in 1933 and 5,110.4 million gallons (14.0 million gallons daily) from the Wanaque in 1933.

Of the total 1934 consumption of 54.7 million gallons daily, 45.3 million gallons daily were consumed in Newark and 9.4 million gallons daily were delivered to other systems. For details see Tables No.1 and No.2 of this report.

PEQUANNOCK WATERSHED THOMAS P. BYRNES, SUPERINTENDENT

In addition to the regular routine which was carried out, the following extra work was accomplished:

1. The erection of a new residence for the superintendent.
2. The building of an incinerator for disposal of refuse.
3. The razing of the house on the Walker property.
4. The destruction of the dam and draining of the pond on the Walker property.
5. Ditching of 80 acres of Timberbrook swamp and the draining of the same.

SANITATION

The usual careful sanitary inspection of all properties on the watershed was carried out. The garbage from 400 homes thereon was collected and the privies, cesspools and septic tanks

totaling in all 975, were cleaned periodically. Frequent and rigid inspection of the reservoirs and streams was made. The rest areas maintained by the city were frequented by thousands of people without mishap. The sanitary condition of these areas was well kept up.

FIRE PROTECTION

With the possible exception of small brush fires there were no forest fires to speak of during the year. Two and three tenths miles of the new fire lines were constructed.

BUILDINGS

The city owned properties were maintained in good repair.

REVENUE

Total revenue from all sources (rents, cordwood, firewood, etc.) amounted to \$7557.78.

CIVILIAN CONSERVATION CORPS AND CIVIL WORKS ADMINISTRATION.

The working force on the watershed was materially increased by two federal government bodies.

The Civilian Conservation Corps work included:

The rehabilitation of Oak Ridge rest area (300 trees planted)

Silvicultural work over 475 acres.

Field planting of 195,000 trees.

Transplanting in the nursery of 185,000 seedlings.

Wood road-construction and repair of 10.8 miles.

The Civil Works Administration accomplished the following:

Ditching and draining Timberbrook swamp.

270 acres of roadside cleaning.

Thinning of pine groves - 6 acres.

Road repair 1/4 mile chiefly cut and fill.

SAFEGUARDING AND PURIFICATION

CEDAR GROVE LABORATORY
J.F.D. BAUERMANN
ASSISTANT BACTERIOLOGIST IN CHARGE

The procedures of the American Public Health Association and the United States Public Health Service, supplemented by methods we find better adapted to our own supply were followed in the laboratory. The latter methods serve for the purpose of checking the former. The following samples from the various sources were examined as in the past:

<u>Source</u>	<u>Microscopical</u>	<u>Bacteriological</u>
Station #1 & 2 Great Notch	590	622
Station #3 Cedar Grove Reservoir Effluent	297	295
Station #6 Belleville Reservoir Effluent	139	263
Station #7 Wanaque at Belleville	293	293
Station #8 So. Orange Ave. Reservoir Effluent	6	244
Station #9 Central Avenue and Ninth Street	3	54
Station #15 Macopin Intake	51	47
Station #16 Upper Macopin Intake	11	9
Station #17 Echo Lake Brook	46	53
Station #20 Kanouse Brook	51	55
Station #25 Clinton Brook	54	55
Station #30 Oak Ridge Brook	52	55
Cedar Grove Reservoir Proper	155	—
Belleville Reservoir Proper	25	34
Clinton Reservoir Proper	18	—
Oak Ridge Reservoir Proper	23	—
Echo Lake Reservoir Effluent	13	—
Station #18 Timber Brook	3	8
42-Inch Pipe Line Great Notch to Belleville	6	16
New Pipe Lines to Newark	—	65
Watershed Miscellaneous	—	9
Special Samples	41	29
TOTAL	1877	2206

MICROSCOPY

The detection of Microorganisms in water is utilized for the express purpose of controlling those that may affect its aesthetic quality, such as odor, taste and color.

Due to the presence of Daphnia and Cyclops it became necessary to by-pass Cedar Grove Reservoir and treat with copper sulphate on May 29th and June 2nd. On June 6th the Reservoir was satisfactory and turned on. On June 12th Walker Pond was ordered treated with Copper Sulphate, prior to emptying it, due to the presence of a variety of protozoan. Treatment was completed by June 15th.

Wallace Pond contained such a large amount of Algae growths that it became necessary to treat same with copper sulphate on June 15th.

Due to the presence of Anabaena in Echo Lake Brook it became necessary to treat same with copper sulphate. Treatment commenced on September 11th and was continued until October 6th.

Macopin Intake likewise was treated for Anabaena on September 15th.

BACTERIOLOGY

A complaint from Rutley as to a case of Dysentery was investigated. The water supplied to the premises was found to be sterile, at the time of complaint on February 2, 1934.

On June 22nd a case of typhoid fever was reported on the border of the watershed. Investigation was made at the time and a report submitted.

Due to Bacteriological flora in South Orange Avenue Reservoir in the summer months it was necessary to chlorinate same. Investigation of the State Board of Health corroborated the findings of the laboratory. Treatment was begun July 11th and continued until September 15th.

Illness of some children was attributed to the water in Bloomfield on October 15th. Investigation indicated the water satisfactory bacteriologically but was dirty. The dirty water occurred when the town reversed the flow of water through its system. It cleared up in a day.

During the hunting season in December extra bacteriological tests were made to note if pollution had increased in the watershed. Nothing alarming was noticed.

CHEMISTRY

A complete chemical analysis was made of the delivered Pequannock Water monthly. Samples were taken at the Venturi Meter in Montclair, New Jersey.

City Board of Health complained of Nitrites and Ammonia on March 16th. The complaint was not warranted as we add ammonia to the water and the Nitrites are a by-product formed.

An electrometric outfit for determining pH values of water was tried out in May, but found not applicable to our supply.

A coal tar odor and taste on June 11th, in Belleville was traced to a coating placed inside the No. 2 line from Great Notch to Belleville.

In April the Prudential Insurance Company complained as to taste of their water. Tests showed that they had a leaky refrigeration system and when this was repaired the trouble ceased. Likewise a complaint from them on June 26th and July 18th on excessive hardness was due to a

mixture of their well water entering their supply.

During the year eleven samples were analysed for the Division of Water and two for the Bureau of Sewers. A large number of pH tests were made through the City of Newark.

PURIFICATION - CHLORINATION

On March 1st the new Chlorination Plant at Macopin Intake was placed in service. All equipment, both ammoniators and chlorinators are under one roof. A reserve chlorinator gives continuous sterilisation should any of the other machines fail. The entire Pequannock Supply being delivered to Newark is now chloramine treated.

Ortho-tolidine tests are made hourly on both pipe lines at Macopin Intake to determine the chlorine residuals. These residuals are further checked at Great Notch.

South Orange Avenue Reservoir was chlorinated during the summer months with success.

Charcoal was used at Upper Intake during the summer to eliminate the grassy odor. It did not help. Vast cleaning of the streams of grass in the red zone eliminated the odor and taste.

Inspections were made at intervals during the year and recommendations made at the time.

During June, Belleville Reservoir was emptied and cleaned out.

WANAQUE SUPPLY

Daily Bacteriological, Microscopical and Chlorine residuals were made at Belleville take-off as in previous years.

As in the past, Wanaque supplied a water of excellent bacterial quality.

During September, the Wanaque Supply was turbid to such an extent that some municipalities complained of it. A conference with Mr. Weston was held October 15th. Fortunately the demand for Wanaque water in Newark was not great and we were least disturbed by it.

Inspection of the Wanaque watershed was made in July in conjunction with City Board of Health inspectors. The site of West Milford Township celebration in Wanaque Watershed was inspected for sewage and garbage disposal.

Boiler pipe corrosion complaints appeared in sections supplied by Wanaque Supply.

RECOMMENDATIONS

1. Chlorination of South Orange Avenue Reservoir in summer.
2. Keeping of Watershed streams free of heavy grassy growths that cause odors and taste to

the water. Improve Idyllease Inn Cesspool overflow, clean Grinshaw Pond and improve Zoller Pond and property.

3. Purchase some properties in red zone that are a continued source of pollution.

4. Experiment on pre-chlorination in watershed this summer.

TRANSMISSION LINES AND CEDAR GROVE RESERVOIR

ALFRED B. ANDERSON
ASSISTANT ENGINEER

The regular work in connection with the maintenance and operation of the 62.43 miles of steel transmission pipe lines has continued during the past year.

A careful inspection is made each week of the entire system to locate any possible source of trouble that might interrupt the service to the City. All air valves are operated, line valves, blow-off valves and other appurtenances are carefully inspected to make sure they are all in good operating order.

In the past year 10 leaks were found and several valves that were not working properly were repaired.

The controlling valves at Canistota, Oak Ridge, Clinton and Macopin Reservoirs were operated and reconditioned. An attempt was made to lower the water in Oak Ridge Reservoir, to repair the flap gates on the reservoir side of the gate house but owing to heavy rains during the latter part of the summer it was impossible to lower the reservoir enough without wasting a large quantity of water. This was not deemed advisable at the time and the project was abandoned until some future time.

At Cedar Grove Reservoir the mechanical equipment used in changing screens was overhauled and repaired; the screens were reconditioned; the wells in the gate house were emptied and the sluice gates were inspected at 6 month intervals.

A new 12-inch connection to the transmission lines was made at Cedar Grove in July 1934 for the Essex County Hospital at Overbrook, New Jersey.

MAINTENANCE OF RIGHT-OF-WAY

During the year 1934 several small foot bridges were rebuilt, ditches and drains for surface water were cleaned and the grass along the pipe lines from Macopin Intake to Belleville Reservoir

was mowed during the summer months. It was necessary to build several small retaining walls along the sides of the right of way to prevent erosion of the fill covering the pipe lines. Existing roadways along the pipe lines were graded and repaired, to maintain ingress and egress to the lines.

TREATMENT PLANT - MACOPIN

The new chlorine and arsenic treatment plant at Macopin has been operating successfully for the past year and has fulfilled all expectations. A connection was made to the wood stave pipe line and the pressure so obtained is sufficient to operate the chlorinators. With this connection in operation it is not necessary to use the pumps installed for this purpose and the saving in electrical current amounts to approximately \$150.00 per month.

WOOD STAVE LINE.

Considerable attention has been given to the wood stave pipe line during the past year. Owing to its deteriorated condition it is impossible to stop all the leakage in this pipe, but the water flows back into Macopin Intake and there is no actual loss.

CEGAR GROVE RESERVOIR

During the year 1934 the usual work in maintaining the general appearance of this reservation and buildings has continued. Ornamental trees were transplanted from the nursery to different sections of the reservation to beautify the reservoir grounds and a number of trees were sent to the watershed for planting there. The city property adjacent to the reservoir was cleared of brush and dead timber, the lawns around the reservoir were mowed during the summer months and the lawns around city-owned buildings were well maintained.

EMERGENCY RELIEF ADMINISTRATION AND CIVIL WORKS ADMINISTRATION PROJECTS

The two Civil Works Administration projects started in December 1933 continued into 1935. Approximately 15 acres of ground in Cedar Grove were cleared and a nursery planted.

An attempt was made to recondition the No. 2 steel pipe line between Belleville and Bloomfield. Approximately 4,000 feet of line were completed. Due to condensation on the inside of the pipe caused by the warm weather the work had to be stopped during the latter part of

April 1934.

As an emergency relief project considerable work was done at Second River in the vicinity of our pipe line crossings. Owing to the narrowing of the stream bed by the Essex County Park Commission, considerable erosion occurred, undermining the retaining walls on the sides of the stream and also the retaining walls crossing the river on the down stream side of our pipe lines.

This emergency relief administration later under the supervision of the Division of Water these walls were under-pinned and the stream bed paved to prevent further erosion.

The cost of materials for this work was shared equally by the City and the Essex County Park Commission.

ANNUAL REPORT
OF THE
BUREAU OF DISTRIBUTION
(DIVISION OF WATER)

BUREAU OF DISTRIBUTION

ROBERT O. SCHOLZ, ENGINEER IN CHARGE

ARTHUR J. SIMPSON, ASSISTANT ENGINEER

During the year of 1934 it was necessary for the Bureau of Distribution to curtail all but necessary expenditures for construction and maintenance work over the system. Budget figures for the year were a sickness because of the necessity for the utmost economy, due to general business conditions.

The following is a summary of the most important work accomplished by the Bureau of Distribution during the year:

Continuance and completion of all Civil Works Administration water main projects approved and started in 1933. This work embraced the following:

Sylvan Avenue - New 8-inch main from Broadway to Sumner Avenue.

Third Avenue - New 8-inch and 12-inch mains from Broadway to Clifton Avenue.

Ridge Street - New 8-inch main from Abington Avenue to Bloomfield Avenue.

Broadway - New 8-inch main from Sylvan Avenue to Verona Avenue.

Sumner Avenue - New 8-inch main from Verona Avenue to Bloomfield Avenue.

Broad Street - New 20-inch High Pressure main extension from Camp Street to Fairhurst Street.

With the exception of the Broad Street project, all of the materials and practically all labor required was furnished by Civil Works Administration, most of the material for the Broad Street project being furnished by the city from available stock.

This work was continued as Civil Works Administration projects until April 30th on which date all activities were discontinued by Civil Works Administration, (due to refinancing) and all projects under way were completed by city forces.

Additional water main projects were then submitted and approved as Emergency Relief Administration work, one of which was started on June 26th, covering the construction of a 20-inch and 24-inch combination feeder extension on Clifton Avenue between Bloomfield Avenue and Lockman Avenue, 3400 lineal feet in length, all materials being furnished by the city from stock available for this work. This job was about ninety percent completed at the close of 1934.

Warren Street - New 8-inch main from Norfolk Street to Hudson Street, done by city forces in advance of street widening.

Sterilization of all new mains.

Completion of inspection, reconditioning and necessary replacement of all operating gate valves, pressure regulators and other appurtenances at Belleville Reservoir Grounds.

In addition thereto the Division Section crews carried on as far as funds would permit their regular inspection, maintenance and repairs on gate valves, hydrants and pressure regulators throughout the system.

Only one major break occurred during the year. During the morning of December 12th a section of 24-inch cast iron pipe on Seventh Avenue, immediately west of Summer Avenue split and considerable damage was done to the street and sidewalks before a shut off was effected. The pavement at this point is old granite block on sand. No interruption of service was experienced however and after repairs were made the line was replaced in service on December 17th.

Under contract with the National Water Main Cleaning Company of New York City, the Division cleaned 1500 lineal feet of badly tuberculated 4-inch main on Macker Avenue with very satisfactory results. This work was of an experimental nature and results clearly indicated an economical method of increasing main capacities.

All record maps were brought up to date and several improvements in methods of keeping accurate records were made.

A new system of preparing job maps was instigated. These drawings are now made on a scale of twenty feet to the inch, and show all available sub-structure information from new base maps being prepared by the Permit Division of the Bureau of Streets. These maps most materially aid the location of all new work and have proven very satisfactory.

During the year an improved pipe spinning rig, under roof, was installed at our Wilson Avenue Yard. This machine is used for applying the bituminastic enamel lining centrifugally to the inside of all sizes of cast iron pipe, previous to removal from the yard to the site of the job.

On June 8th because of a consistent dirty water condition, it was necessary to by-pass Belleville Reservoir. The reservoir was drained, broomed and washed and after satisfactory sterilization was placed back in service August 3rd. During the period that the reservoir

was out of service, Waukena water was fed directly into the area normally supplied by Belleville Reservoir.

Gas ferrets again persisted in South Orange Avenue Reservoir and upon recommendation of Mr. J. F. J. Thompson, chloramine treatment of the reservoir, applied during filling operations, was started on July 1942 and continued regularly until September 1942 with favorable results.

During the year the necessity for replacement of certain sections of water mains on Dorcas Avenue and part of Belmont Ave., badly corroded from acid soil action, was again stressed. This work should be done as soon as finances will permit of same.

Flushing - Dirty water complaints were general in May and extensive flushing was necessary during the spring and summer of the year in the areas supplied by both Waukena and Waukena water. The entire system was covered in the flushing operations. Routine flushing of dead ends and areas in the vicinity of industries, was started during the year and continued. To avoid promiscuous use of hydrants during working hours all hydrants whose operation might cause a dirty water condition in laundry areas, were marked with a red band on the barrel and notices were sent to all probable users warning against any use during certain hours.

Hydrant Painting - The Bureau did extensive experimental painting with various types and colors of weather resisting paints and enamels with a view to adoption eventually of new color schemes for hydrant markings, recommended by the Committee on Hydrant Markings of the New England Water Works Association and the American Water Works Association. These color schemes to be standardized and indicate thereby the capacities of the hydrants, a great advantage in fire fighting.

An extended period of below zero weather during the early part of the year resulted in a rush of frozen meters and several services. The meters were removed to the Meter Laboratory for repairs and good results obtained in thawing services by use of portable electric arc machines.

The high amount of frozen meters during this cold spell severely taxed the forces of the Meter Laboratory and although additional help was provided it was some time before the work was caught up. (see report of Meter Laboratory incorporated herein).

DISTRIBUTION SYSTEM

The total length of pipe owned by the city is now 532.223 miles in the low pressure system and 28.07 miles in the special segregated high pressure fire system. Connected with the mains in the low pressure system are 4,272 fire hydrants and in the high pressure system 365. There are 8,010 gate valves which control the flow of water in the mains of the low pressure system and 263 gate valves controlling the flow of water in the high pressure system. There are 71,436 connections, known as services in the low pressure system, of which 55,423 are in use. Through these, water for domestic, commercial and public use is drawn. There are 301 connections in the high pressure system, of which 267 are in use. The water pressures in the low pressure system range from 30 to 130 pounds and in the high pressure system from 100 to 160 pounds per square inch.

STREET MAIN EXTENSION, LOW PRESSURE SYSTEM

The total extension to street mains in the city during the year 1934, was as follows:

4,815 lineal feet = 0.912 miles from 8" to 12" diameter.

The amount of work done in relaying was as follows:

12,874 lineal feet = 2.438 miles from 6" to 12" diameter.

The amount of work done in lowering pipe was as follows:

11 lineal feet = 0.0021 miles 6" diameter.

The total amount of pipe of different diameters, deducting old pipe taken out and adding new pipe of larger size in place of the old pipe removed, consists of 2,010,136 lineal feet or 532.223 miles.

The number of low pressure taps made during the year was 35. Of these 35 were of 1-inch diameter, 9 of 1-1/2 inch, 11 of 2-inch, 13 of 4-inch and 15 of 6-inch diameter.

The total number of low pressure taps in the city at the end of the year 1934 was 71,436, while the number of taps in actual use was 55,423. The difference shows the services installed in advance of street pavements.

During the year 62 low pressure hydrants were set. Of these 43 were replacements of old hydrants, and 19 were additions to the number already in place; 4 hydrants were taken out

and not replaced, making the total number of hydrants in the low pressure system:

In the City.....	4,224
Silver Lake Section and Belleville.....	<u>48</u>
Total.....	4,272

STREET MAIN EXTENSION, SPECIAL SEGREGATED HIGH PRESSURE FIRE SYSTEM

The extension of high pressure mains during the year 1934 was as follows:

1443 lineal feet = 0.273 miles 20" diameter.

The total amount of high pressure pipe of different diameters on December 31, 1934 was as follows:

148,206 lineal feet = 28.07 miles.

The total number of high pressure taps in the city at the end of the year 1934 was 301, while the number of taps in actual use was 267. The difference shows the services installed in advance of street improvement.

During the year 5 high pressure hydrants were set, making a total of 385 high pressure hydrants in the City. The number of high pressure taps made during the year was 1.

Mr. Frederick G. Schorer, Superintendent of Construction and Maintenance, reports that during the year 1934 there were 11 breaks on mains repaired and that a total of 3,220 leaks covering mains, hydrants and services were investigated and when necessary, repairs were made. Poor pressure complaints investigated totaled 857. There were 353 services cleaned out at the main and 591 new curb boxes set. A total of 1,095 hydrant repairs were made, this high percentage of the entire system being accounted for by improper and unauthorized use together with a more comprehensive inspection and maintenance schedule.

Mr. Arthur A. Stemmler, Chief Plumbing Investigator, in charge of the Bureau of Inspection, reports as follows:

Special investigations were made by the Bureau of Inspection investigating buildings and plants whenever illicit distilleries were raided by the Federal Authorities. The investigators found that in eight (8) of the plants raided either water connections were taken off on the street side of the water meter or new direct connections to the water main were made by tunneling. Water bills amounting to several thousand dollars were made out against the owners of the properties and liens placed or filed.

Surveys and drawings of the water pipe layouts in manufacturing plants and service connections to buildings are being made and records in the form of maps are being completed and brought up to date for use by the Division of Accounts. Thousands of dollars of omitted accounts are now being added to the records. Water services marked in ledgers "dead or water off" have been found alive and in use. In addition thereto unmetered high and low pressure fire hydrants not charged for years have been discovered to be in use as other connections inside the property.

In addition to the above the following work has been accomplished during the year:

Daily water readings	2,574
Water Inspections	3,658
Service Inspections	813
Special Investigations	5,055
Mason and Building Inspections	4,052
Water Searches	91
By-passes Sealed	93
Unmetered Fire Service Inspections...	1,017
Surveys and Drawings	
Size A - - -	60
B - - -	21
C - - -	52
Total - - -	133
covering.....	817 Taps

25 Water meters supplying other municipalities are read weekly.

Special efforts were made to locate foreign water connections between the City water supply and private systems. Four (4) connections were found and removed by owners.

Mr. Luke A. Kenney, Clerk of the Meter Laboratory reports as follows:

The Meter Laboratory located at 352 South 8th Street, Newark, N.J. is responsible for the servicing and proper functioning of every water meter on Newark water lines. It also keeps an invaluable record of each meter, giving in detail, its location, size, make and number and a record of all tests, repairs and charges from the original date of purchase until it is scrapped.

Its staff on December 31, 1934 consisted of 25 men made up of clerks, repairmen, testers, truckmen, laborers and part time porters.

The following work covering 7,503 - 5/8" to 6" meters inclusive and made up of ten different makes was done in the Meter Laboratory proper:

1,243	meters were found stuck
3,351	" damaged by frost
139	" " excessive heat
1,214	" received for test only.

In addition 6,101 were tested after repair and 647 new meters given an acceptance test, including all sizes and makes. A total of 676 meters were condemned.

Approximately 10,000 telephone calls and 5,000 pieces of mail were handled during this period.

Three trucks, one less than previous years, besides the removal and resetting of meters, did the following work in the field:

1,278	inspections
779	special readings
112	changed registers
62	glasses replaced
35	lids replaced
36	seals replaced
486	leaks stopped
31	couplings sealed
15	dials replaced.

Special tests and repairs in the field for the most part 2" to 16" totalled 375.

A stock room was inaugurated during the latter part of the year. Meter parts and general supplies are kept in charge by one man, who is responsible for their disposition and replenishment. He is also charged with the receiving of all material and the handling of shipping when necessary. This department has been an outstanding need for years and should result in a substantial saving in that all drafts made on the stock room must be properly accounted and charged for. It will prevent pilfering and enable us to anticipate our requirements more accurately. It will also eliminate running out of necessary material and the attendant confusion.

Increase in the charges made to the consumer for meter repairs and service and the abolition of a type of service formerly given gratis, made effective the latter part of the year, should result in a better financial showing for this department, in the future.

FINANCIAL ACCOUNTS covering METER READING, BILLING AND COLLECTING, are included in a separate report submitted by the Chief Accountant of the Department of Public Affairs.

TABLE I.

CONSUMPTION STATEMENT FOR YEAR ENDING DECEMBER 31, 1934.

1934	Total consumption per month, Million Gallons, Newark, Belleville, Bloomfield, Elizabeth, Nutley, Wayne, Rutherford, Elm- hurst, Jersey City, Hudson County, Overbrook Hospital, Essex County, Verona.	Average daily consumption Million Gallons Newark and Suburbs	Total consumption per month, Million Gallons Newark	Average daily consumption, Million Gallons Newark	Average Temperature Newark	Rainfall - Inches Newark
MONTH						
January	1505.6	51.1	1327.9	42.3	34.0	3.87
February	1385.7	56.6	1307.0	46.8	19.8	4.24
March	1691.6	54.6	1420.5	45.8	37.5	5.25
April	1522.0	50.7	1273.3	42.4	48.5	3.85
May	1631.8	52.6	1343.0	43.3	61.2	5.26
June	1784.4	59.5	1441.4	46.0	73.4	5.02
July	1921.1	62.0	1608.1	51.9	75.4	3.46
August	1736.7	56.0	1435.3	46.3	71.4	2.33
September	1527.0	52.9	1291.2	43.0	68.3	10.35
October	1657.6	53.5	1390.8	44.9	54.0	2.95
November	1594.2	53.1	1336.5	44.5	48.2	2.21
December	1652.3	53.5	1372.0	44.2	33.4	2.18
TOTAL	19956.0	656.1	16546.4	542.3	625.1	50.97
AVERAGE		54.7	16547.0	45.3	52.1	4.25

Estimated Population of Newark by Board of Health, December 31, 1934 - - - - - 445,000

Estimated Population of Town of Belleville Board of Health, December 31, 1934 - - 28,000

TABLE II.

QUANTITIES OF WATER DELIVERED TO OTHER SYSTEMS

1934	Pelleville	Bloomfield	Elizabethtown	Elizabethtown Water Co.	Matley	Wayne	Packanack	Essex County Overbrook Hospital, Verona	East Orange	Total	Received from Manaque Supply	Quantities diverted from Packanack Water shed
January	57.5	82.4	80.2	1.1	27.0	1.5	2.0			257.7	467.7	1131.4
February	63.2	86.5	92.5	1.2	31.2	1.5	2.6			272.7	514.4	1084.8
March	58.1	88.0	92.8	1.3	27.4	1.5	2.0			271.1	534.3	1151.3
April	72.4	81.4	67.6	1.1	22.9	1.4	1.9			243.7	460.2	1041.8
May	98.6	93.4	97.7	1.3	29.0	1.5	2.3			283.3	513.4	1141.7
June	64.2	116.1	113.3	1.4	41.5	2.0	3.6		0.9	343.0	691.4	1054.3
July	65.4	100.0	103.7	1.5	36.4	2.4	3.6			313.8	790.6	1177.9
August	59.5	135.6	92.8	1.3	36.5	2.6	3.1			301.4	556.4	1102.5
September	58.1	113.8	83.5	1.4	39.3	3.0	2.7			295.8	497.6	1083.2
October	54.3	99.6	68.5	1.3	36.7	1.7	3.2	1.5		266.8	533.5	1104.4
November	49.9	99.9	62.9	1.3	37.0	1.2	2.0	3.5		257.7	509.1	1096.2
December	49.9	109.2	81.6	1.5	36.4	1.8	2.6	3.3		286.3	544.3	1100.6
TOTAL	705.1	1186.9	1037.1	15.7	401.3	22.1	31.6	8.3	0.9	3409.0	6629.9	13350.1

DIVISION OF WATER

SUMMARY OF STATISTICS OF THE NEWARK

NEW JERSEY, WATER WORKS

For Year Ending December 31, 1934.

Population by census, 1930.....	140,000
Date of construction.....	1889-1891
By whom owned.....	City of Newark
Source of supply.....	Pegannock and the Manasquan Watersheds
Mode of supply.....	Gravity

STATISTICS OF CONSUMPTION OF WATER

Population, City of Newark.....	145,000
Consumption, for the year, City of Newark.....	16,517.0 m.g.
Consumption, for the year, Town of Belleville.....	795.1 m.g.
Consumption, for the year, Town of Bloomfield.....	1,136.9 m.g.
Consumption, for the year, Town of Elizabeth.....	1,037.1 m.g.
Consumption, for the year, Town of Nutley.....	401.3 m.g.
Consumption, for the year, Township of Wayne.....	22.1 m.g.
Consumption, for the year, Passanunk Lake.....	31.6 m.g.
Consumption, for the year, Elizabethtown Water Company.....	15.7 m.g.
Consumption, for the year, East Orange.....	0.9 m.g.
Consumption, for the year, Verona, Overbrook Hospital.....	8.3 m.g.
Total Consumption for the year.....	19,956.0 m.g.

Passed through meters in the city.....	13,927.4 m.g.
Percentage of consumption metered in the city.....	69.17 %
Average daily consumption, city and suburbs.....	54.7 m.g.
Average daily consumption in the city.....	45.3 m.g.
Gallons per day to each inhabitant in the city.....	101.8
Gallons per day to each tap in use in the city.....	913.43
Cost of supplying water per million gallons figured on total maintenance.....	\$72.11
Total cost of supplying water per million gallons figured on total maintenance, plus interest on bonds.....	\$123.29

STATISTICS REGARDING DISTRIBUTION SYSTEM

Mains, Low Pressure System

Kind of pipe.....	Cast iron and steel
Sizes from.....	4-inch to 60-inch
Extended.....	4,815 feet during year
Discontinued.....	418 feet during year
Total now in use.....	532-1176/5,200 miles
Number of hydrants added during the year.....	19
Number of hydrants discontinued during the year.....	4
Number of hydrants replaced with new or reconditioned hydrants.....	13
Number of public hydrants now in use.....	4,272
Number of stop gates added during the year.....	14
Number of stop gates now in use.....	8,010
Range of pressure on distributing mains.....	30 to 130 lbs.

Mains, High Pressure System.

Kind of pipe.....	Cast Iron
Sizes from.....	6-inch to 30-inch
Installed.....	1,443 feet during year
Total now in use.....	29-366/5,200 miles
Number of hydrants added during the year.....	5
Number of public hydrants now in use.....	385
Number of stop gates added during the year.....	1
Number of stop gates now in use.....	(Revised list over system) 263
Range of pressure on high pressure system.....	100 to 160 lbs.

Services, Low Pressure System.

Kind of pipe.....	Lead, brass and cast iron
Sizes from.....	5/8-inch to 6-inch
Total number of services in the city, January 1, 1934.....	71,402
Total number of services added during 1934 (5/8-inch to 6-inch diameter).....	83
Total number of services abandoned during 1934.....	129
Total number of services in city, January 1, 1935.....	71,436
Total number of regular services in use January 1, 1935.....	54,662
Total number of regular services in use metered January 1, 1935.....	53,813
Total number of regular services in use unmetered January 1, 1935.....	849
Percentage of regular services in use metered January 1, 1935.....	98.16%
Total number of fire line services in use January 1, 1935.....	761
Total number of fire line services in use metered January 1, 1935.....	90
Total number of fire line services in use unmetered January 1, 1935.....	671
Percentage of fire line services in use metered January 1, 1935.....	11.83%

Connections, High Pressure System.

Kind of pipe.....	Cast Iron
Sizes.....	1-1/2-inch to 6-inch
Number of connections added during the year.....	3
Number of connections in the city.....	301
Number of connections in use (1-1/2-inch to 6-inch).....	267
Number of meters added.....	0
Revised list of meters now in use.....	113
Percentage of connections in use metered.....	43.82%

ANNUAL REPORT
OF THE
BUREAU OF ENGINEERING
(DIVISION OF WATER)

BUREAU OF ENGINEERING

JAMES E. GARRATT

DESIGNING ENGINEER

GENERAL PLANNING

PEQUANNOCK AQUIEDUCT TRANSMISSION PROGRAM - Following conclusion of studies begun in 1933 and completed in March 1934, the following program was adopted applying to the work which must be done, over the period of the next five years, to provide sufficient aqueduct capacity to convey the entire supply, available from the Pequannock Watershed, to Cedar Grove Reservoir and to the City of Newark in which this supply is used principally.

PROGRAM OF PEQUANNOCK TRANSMISSION AQUIEDUCT WORK

From Cedar Grove Reservoir to the City at Bloomfield Avenue Tower

<u>STEP WHEN REQUIRED</u>	<u>CONSTRUCTION</u>	<u>EST. COST</u>	<u>RESULTING TOTAL</u>	<u>CAPACITY M.G.D. INCREASE</u>	
1	1934	New 60" connecting line in Alexander Ave. between 60" Cedar Grove line and 48" - 42" Pequannock lines, 5000 ft.	\$225,000	60	-
2	1935	Replace 10,000 ft. of 36" steel line, Belleville Res. to Tower with 48"	350,000	45*	30
3	1934-35	Recondition 19,000' each of 48 & 42" Pequannock lines between Broad St. Bloomfield and Belleville Reservoir.	130,000	62	13
4	1936	Recondition 35,000' of 60" Bloomfield Avenue line	120,000	80	33

* Existing parallel 36-inch cast iron line has capacity of 15 m.g.d. giving a total capacity of 60 m.g.d. Belleville Reservoir to Tower.

From Manasquan to Cedar Grove Reservoir

1	1935	Recondition 30,000' of 48-inch No.1 Pequannock lines, Manasquan to Raritan Hatch	105,000	51	4
2	1936	Recondition 30,000' of 48-inch No.2 line, Manasquan to Raritan Hatch	105,000	56	2
3	1936	Recondition 10,000' of 48-Inch No.1 line from Aunt Sally's Hill to Great Hatch including 10,000 thru swamps	35,000	61	5

4	1937	Recondition 20,000' of 12 inch No. 2 line from Pompton Notch to Great Notch, excluding 20,000 thru swamps.	105,000	63	2
5	1937	Recondition 20,000' of 12-inch No. 1 line from Pompton Notch to Aunt Sally's Hill excluding 10,000 thru swamps.	70,000	65	2
6	1938-9	Replace 42" & 48" Pequanook lines where pipe is in poor condition thru swamps with 42,000' of 48" pipe.	1,400,000	79	29

From Bloomfield Avenue Tower to South Orange Avenue Reservoir.

1	1937	New 36-inch line, 12000'	300,000	25	25
2	1938	Recondition 12,000' of 36-inch cast iron line.	60,000	25	10

RECONDITIONING 12-INCH LINE TO BELLEVILLE RESERVOIR - The first section of pipe line reconditioning was started in December 1933 and continued until the spring of 1934 as a C.W.A. project. It was hoped that under this project the portions of the two Pequanook Lines from Broad Street, Bloomfield to Belleville Reservoir could be cleaned and relined with a bituminous enamel. The material for the entire line was purchased by the Civil Works Administration. Work proceeded very slowly. With the advent of warm weather late in April 1934 it was necessary to abandon the work as it was impossible to keep the interior walls of the pipe dry enough to receive the heated enamel. About 4000 feet of the 42-inch No. 2 line just west of Belleville Reservoir was relined.

60-INCH ALEXANDER AVENUE CONNECTING AQUEDUCT - Consideration of the first step of new construction needed in this program of Pequanook Aqueduct Reconditioning started early in the year and continued throughout the year. This first step is a 60-inch steel conduit proposed to be laid in Alexander Avenue, Upper Montclair and Bloomfield, between the existing 60-inch Cedar Grove Reservoir line in Grove Street and the 42-inch and 48-inch Pequanook lines just east of Broad Street, Bloomfield. The plans and specifications for the work are practically completed with final location selected. Preliminary arrangements for right-of-way across the golf club at the Broad Street end of the line are being made. The execution of a contract for this work is awaiting the Federal government's determination of policy in regards to a public works construc-

tion program.

RE-LINING NO. 2 PEQUANNOCK LINE, MACOPIN TO FORTY-ONE MILE - At the end of the year plans and specifications for relining about 30,000 feet of the No. 2 Pequannock steel pipe line from Macopin Inlet to Fortynine Mile were well under way. The proposed work contemplates cleaning this section of the line and placing a cement-mortar lining by a machine which applies the cement mortar centrifugally and regulates the thickness of lining as desired. Demonstrations of the operation of this machine were viewed at various times during the year. A section of 72-inch Jersey City line in which such a lining had been in service for about a year was inspected on September 22, 1934, and gave definite indication of the practicability and serviceability of the lining placed by such a machine. It is hoped that a contract for this work can be awarded early in the spring of 1935 and the work completed before midsummer when heavy drafts upon the Pequannock system would make it necessary to utilize the line.

NEW LINE - BLOOMFIELD AVENUE TO SOUTH ORANGE AVENUE WATER TOWER - Preliminary studies for the location of an additional pipe line from Bloomfield Avenue Tower to South Orange Avenue Reservoir were made. This is work which would be one of the last steps of the Aqueduct Program, but it is desirable, if possible, to select a location for this pipe so that space can be reserved in the streets through which it would pass.

WATER AUTHORITY

Legislation was agitated early in 1934 for the creation of a so-called Water Authority, an agency authorized by the State to take over and administer the major water-supply developments of the state for the general good of all municipalities requiring water and to construct additional water supplies as required. Studies were made of the effect of such a proposal upon the Newark water supply situation with special regard to the financial aspect thereof. A report embodying the results of these studies was submitted to the Chief Engineer on May 1, 1934. No action was taken by the legislature during the year, but the matter is still under consideration.

COST OF WATER AND VALUE OF PLANT

Because of this Water-Authority agitation it is essential that the facts be known as to the cost of water to the City of Newark in all its details as well as the cost and present worth of the structures which comprise the Pequannock supply. From time to time during the year studies

were made of the wholesale cost of Pequannock and Wanaque water, that is, water delivered to the Distribution System, as well as the cost of distributing water from which the complete cost of delivered water was obtained. These studies show that the wholesale cost of water per million gallons delivered to the distribution system in Newark will vary between \$95.00 and \$105.00 during the next ten years, dependent upon the quantity of water consumed. The cost of water delivered to a consumer in Newark will be in the vicinity of \$130.00 per million gallons.

Depreciation figures for the various Wanaque structures were determined and furnished to the Accounting Division for inclusion in the Financial Report for the year 1934.

Computations of the quantities of the various classifications of work entering into the construction of the dams, gatehouses, aqueducts and other structures which make up the Pequannock water supply system were started in May and continued as opportunity permitted during the year. It is hoped at an early date to carry this work forward to such an extent that the present value of the important features of these works can be quickly ascertained.

SUPPLIES TO OTHER MUNICIPALITIES

Essex County for use of its institutions at Verona entered into a contract with the City of Newark for a supply of water from the Pequannock system on December 1, 1933. Delivery of water began on August 21, 1934, an average of three million gallons per month is being used.

The Town of Nutley continued negotiations for the renewal of its contract for a supply of water from the Pequannock system at \$90.00 per million gallons. Following conferences on September 21st and October 23rd, a definite form of contract offering water at \$100 per million gallons was submitted by the City of Newark. At the end of the year the town was negotiating with the Passaic Valley Water Commission for water at \$75.00 per million gallons.

Bayonne's water supply from the Wanaque Reservoir and the revenue which the North Jersey District Water Supply Commission derives therefrom for the account of the participating municipalities, was the subject of various hearings before the district commission during the year. On September 26, 1934 the District Commission formally adopted a formula for the apportionment of the revenue from the sale of water to Bayonne. As there is a possibility that certain participants may take legal exception to this decision, no funds have as yet been distributed.

OPERATING STUDIES

BELLEVILLE RESERVOIR:- Preliminary studies were made of the possibility of rearranging outlets and connecting piping in the vicinity of Belleville Reservoir so that Wanaque water could be supplied directly to the reservoir and the City fed directly therefrom. By so doing it would be possible to do away with the regulators which now cut the Wanaque pressure to that desired in the City.

SOUTH ORANGE AVENUE RESERVOIR:- With a view to the possibility of installing regulators at South Orange Avenue Reservoir to be used at times when the reservoir is being bypassed and to make unnecessary the hand control of the supply needed at such time, a tentative location for such regulators in South Orange Avenue Reservoir was selected and plans were prepared of the details of such an installation.

ELECTROLYSIS:- Indications that the electrolysis situation is not without sources of trouble were obtained at several locations during the year. During May several services on Summer Avenue in North Newark had to be renewed due to electrolysis conditions which seem to exist between water pipe and underground cables of the New Jersey Bell Telephone Company. A similar trouble occurred during July in South Orange Avenue near Hayes Street. Measurement of the currents flowing on the feeder mains was made during October. No excessively large currents were observed.

FLUSHING:- Very extensive flushing was necessary, both in the areas supplied with Pequannock and Wanaque water during the summer of 1934. Complaints became rather general in May. The entire City was covered in the flushing operations. A routine of monthly or more frequent flushing of dead ends and of areas in the vicinity of laundries was inaugurated which has since been continued.

While conditions in Newark as applying to Wanaque water were no worse than in previous years and were more satisfactory than in areas supplied with Pequannock water, complaints in Paterson, Passaic and Clifton as to Wanaque water were so general that the Passaic Valley Water Commission protested vigorously to the North Jersey District Water Supply Commission and demanded that immediate steps be taken for the filtration of the Wanaque Supply. Conferences with all Wanaque participants were held at the headworks at Wanaque Dam on October 3rd. Mr. Robert Spurr Weston was engaged to advise in this regard and conferred with Newark engineers on October 15th.

Report submitted by him on October 25th commended the quality of the Wanaque water, pointed out that dirty water troubles were due to actions in the distribution systems and that filtration of Wanaque water would be an unwarranted luxury. Systematic flushing was offered as the remedy for the troubles.

RECORDS

PEQUANNOCK PROPERTY MAPS: - Index maps showing the properties owned by the City of Newark on its Pequannock Watershed were brought up to date early in the year. Maps of the individual properties upon which the City of Newark has right-of-way for the Pequannock Pipe Line and which the City owns on the Watershed were about 40 percent completed during the year. In connection with this work, surveys of more than fifty properties, the boundaries of which were in dispute, were made, as a result of which most of the disputes were settled. Also in this connection searching of titles for these properties is being completed.

OPERATING MAPS: - Operating maps and records were brought up to date from time to time and additions made thereto. The principal addition was a set of maps of the high pressure fire system in the City of Newark, which was completed late in the year and blueprint copies issued for the use of all operating forces.

VALVE AND HYDRANT DRAWINGS: - Drawings showing details of the various sizes of Newark Standard gate valves were completed. Drawings showing the details of the Newark Standard Low Pressure Hydrant were also prepared.

WATER STATISTICS: - Tabulations of rainfall, runoff, temperature, water consumption and other statistics pertaining to the water supply were kept up to date and for the most part are in form for distribution to interested parties.

COSTS

BUDGET: - The estimated expenditures for the year 1935 was prepared during November for use in connection with the consideration given to the Annual Budget of the City of Newark.

JOB COSTS: - Estimates were prepared of the various proposed main pipe construction jobs and upon the completion of the work, the actual cost of each installation was figured. Cost figures for service installation, hydrant installations and other construction work were also prepared.

PHOTOSTATIC LABORATORY

During the year 1934 the work done in this laboratory if charged at the rates in force in commercial studios would have cost in excess of \$8,000. This is about \$2,000 less than the amount of work done in the previous year. Of the total, about \$1160 was for work done for the Division of Water which bears the entire expense of the laboratory. Work for the Department of Revenue and Finance totaled \$2,071. A new photostat machine will probably be required during the year 1935.

TRANSPORTATION SURVEY

From January and through May 1934, office assistance was given to the Bureau of Transportation in connection with a survey of bus and trolley transportation in Newark. Graphical comparisons were made, for each route in the city, of theoretical and actual schedules and bus or car capacity.